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ABSTRACT

The purposes of this study were to examine the degree of comprehension shown by a group of college students when listening to a lecture at the normal rate of 175 words per minute and at the time-compressed rate of 275 words per minute for forty minutes, and to assess students' attitudes toward the new medium of time-compressed speech by means of a questionnaire. Standard deviations were stable and time-compressed comprehension scores showed losses that were significant at the .01 level. Nine conclusions were drawn from the study. Student responses on the questionnaire indicated that they preferred the normal rate of speech. It was decided that time-compressed speech as an educational medium needs further study. (RB)

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COMPREHENSION AND OPINIONS BY COLLEGE STUDENTS OF TIME-COMPRESSED LECTURES

Loretta Adelson

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ABSTRACT

COMPREHENSION AND OPINIONS BY COLLEGE STUDENTS OF TIME-COMPRESSED LECTURES

Problem

Time-compressed speech has been suggested as an educational medium for sighted and blind students. Researchers have reported high comprehension of short, unrelated passages. One-hour lectures were used for this study since they were considered to correspond more realistically to college level tasks.

Method

A repeated measurement design was used in presenting equated lectures to 200 students at 175 and 275 words per minute. Mean comprehension scores, standard deviations, t-tests and percentiles were used to analyze the data. A questionnaire elicited responses concerning fatigue, anxiety, tension, and rate preference.

Data

Standard deviations were stable. Time-compressed comprehension scores showed losses that were significant at the .01 level. Rate was statistically significant. Questionnaire responses indicated the normal rate as more desirable.

Conclusions

The Fairbanks efficiency index is questioned. Time-compressed speech as an educational medium needs further study. Limited possibilities are given.

Problem

The purposes of this study were: (1) to examine the degree of comprehension that was shown by a group of college students when listening to a one-hour lecture of educational materials at the normal rate of speech, 175 words per minute (wpm), as compared with the degree of comprehension that was shown by the same group of college students when listening to an equated one-hour lecture at a time-compressed rate of 275 wpm for forty minutes; (2) to assess by means of a questionnaire, the physical and psychological reactions of the listeners during the two listening conditions, as well as their attitudes toward the new medium.[1]

Time-compressed speech refers to recorded speech which has been altered in time. Fairbanks, Everitt and Jaeger, in 1952, produced an electronic device which was capable of picking up millimeters of sound at a predetermined rate, discarding those sounds, and then abutting the remaining sounds. The result was speech recorded at any desired

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[1] John B. Carroll, Language and Thought (Englewood Cliffs, N.J.: Prentice-Hall, 1964) has suggested that syllables per minute is a better measure of rate. As noted under Stimulus Materials, the number of syllables per 100 words was one of the criteria used in the equating of the lectures used for this study.

rate without the loss of any one complete phoneme, continuity, or the original pitch and vocal quality.[1]

Related Research

In order to test comprehension of time-compressed speech, Fairbanks, Guttman and Miron composed two factual passages, each over 1500 words in length. They reported that at 282 wpm "the response was slightly less than 90%" of the response at 141 wpm.[2] Encouraged by such results, time-compressed speech was then given serious consideration as a useful medium in the education of the blind as well as the sighted, and research in its use was supported by the Office of Education.[3]

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[1]Leslie H. Cramer, "An Introduction to Speech Compression Techniques: The Early Development of Speech Time Compression Concept and Technology," Proceedings of the Second Louisville Conference on Rate and/or Frequency-Controlled Speech (Louisville: University of Louisville, 1971), pp. 6-20.

[2]Grant Fairbanks, Newman Guttman, and Murray S. Miron, "Effects of Time Compression upon the Comprehension of Connected Speech," Journal of Speech and Hearing Disorders, XXII (March, 1957), 18.

[3]Emerson Foulke and Thomas Sticht, "A Review of Research on the Intelligibility and Comprehension of Accelerated Speech," The Comprehension of Rapid Speech by the Blind: Part III, ed. by Emerson Foulke (Non-Visual Perceptual Systems Laboratory, Louisville: University of Louisville, 1969); Herbert L. Friedman, David B. Orr, and Cynthia N. Graae, Further Research on Speeded Speech as an Educational Medium, Final report, Parts 1-5, July 1965-September 1967 (Silver Spring, Md.: American Institutes for Research in Behavioral Sciences, Project No. 5-0801, Grant No. OE 7-48-7670-267, U.S. Department of Health, Education and Welfare, Office of Education).

On the whole, materials that have been used have been comparatively short in length. One researcher used passages that ran for 18 to 20 minutes at the normal rate, 175 wpm.[1] More frequently, however, researchers have relied upon standardized listening comprehension tests.[2] The use of such tests may be questioned since the tests are comprised of unrelated passages varying in length from 25 seconds to 3 minutes and 45 seconds. Each passage is followed immediately by a written test of comprehension. In a critical evaluation of the STEP Listening Test Lorge wrote, "In terms of the objectives stated by the teachers and educators, this

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[1]Herbert L. Friedman, David B. Orr, and Cynthia N. Graae, Further Research on Speeded Speech as an Educational Medium, Final report, Parts 1-5, July 1965-September 1967 (Silver Spring, Md.: American Institutes for Research in Behavioral Sciences, Project No. 5-0801, Grant No. OE 7-48-7670-267, U.S. Department of Health, Education and Welfare, Office of Education).

[2]George V. Gore, "A Comparison of Two Methods of Speeded Speech Presented to Blind Senior High School Students" (unpublished Ed.D. dissertation, Teachers College, Columbia University, 1968); Robert E. Jester and R. M. W. Travers, "Comprehension of Connected Meaningful Discourse as a Function of Rate and Mode of Presentation," Journal of Educational Research, LIX, No. 7 (1966), 297-302; Sally McCracken, "Comprehension for Immediate Recall of Time Compressed Speech as a Function of Sex and Level of Activation," Proceedings of the Second Louisville Conference on Rate and/or Frequency-Controlled Speech (Louisville: University of Louisville, 1971), pp. 313-19; Leslie A. Michel, "Levels of Comprehension and Activation Under Conditions of Time-Compressed Speech" (unpublished Master's thesis, Florida State University, June, 1970).

makes for relatively short listening comprehension situations. Among high school and college students the expectation should be for significantly longer listening time and for more questions."[1] The customary college lecture hour would appear to be a more realistic condition to use in the assessment of the listening comprehension of time-compressed speech. This study has done so.

Studies which have made an attempt to ascertain the reactions of the subjects to time-compressed speech have been limited in number and scope. McCracken has used the Galvanic Skin Response test to assess the level of activation or physiological arousal of the listener.[2] Michel has also tried to evaluate activation levels, but by means of heart rates recorded during the listening experience.[3] Orr and Friedman have used what they have described as "de-briefing

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[1]Irving Lorge, article evaluating the Sequential Tests of Educational Progress, The Fifth Mental Measurements Yearbook, ed. by Oscar K. Buros (Highland Park, N.J.: The Gryphon Press, 1959), p. 572.

[2]Sally McCracken, "Comprehension for Immediate Recall of Time Compressed Speech as a Function of Sex and Level of Activation," Proceedings of the Second Louisville Conference on Rate and/or Frequency-Controlled Speech (Louisville: University of Louisville, 1971), pp. 313-19.

[3]Leslie A. Michel, "Levels of Comprehension and Activation Under Conditions of Time-Compressed Speech" (unpublished Master's thesis, Florida State University, June, 1970).

questionnaires" concerning the attitude of their subjects toward the use of time-compressed speech as an educational medium.[1] While it was not the central question of this study, a questionnaire calling for the listeners' physical and psychological responses provided some insight into the use of time-compressed speech in the educational setting.

Method

Subjects

Two hundred undergraduate students at Brooklyn College of the City University of New York volunteered for this study. All spoke English as their first language.

Hearing Test

Only those students who wrote the correct answers to all 21 questions of the Harvard Psycho-Acoustic Laboratory Auditory Test No. 12 participated.[2]

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[1] David B. Orr and Herbert L. Friedman, Research on Speeded Speech as an Educational Medium, Progress Report, Grant No. 7-48-7670-203 (Washington, D.C.: U.S. Department of Health, Education and Welfare, Office of Education, June, 1964).

[2] Hallowell Davis and S. Richard Silverman, Hearing and Deafness (3rd ed.; New York: Holt, Rinehart and Winston, 1970), p. 490.

Stimulus Materials

Six passages from English history, equated by Friedman and Orr, were used to comprise two one-hour lectures.[1] The passages had been equated for length, the average number of words per sentence, the average number of syllables per 100 words, listening grade as determined by Rogers' listenability formula, reading ease measured by the Flesch formula, the number of independent clauses, and the average number of words not on the Dale list. Three passages were recorded on one tape and constituted Lecture A. Three other passages were recorded on another tape and constituted Lecture B. Both lectures were prepared at the normal and time-compressed rates in order to satisfy the design given below in Figure 1. In order to familiarize the students with time-compressed speech, a two-minute selection from a seventh passage was taped so as to immediately precede the time-compressed lecture. The lecture ran for 60 minutes at the normal rate, and for 40 minutes at the time-compressed rate.

Comprehension Tests

Listening comprehension tests for the six passages had been devised by Friedman and Orr. The test for each lecture

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[1]The author is indebted to David B. Orr and Herbert L. Friedman of the American Institutes for Research, Silver Spring, Maryland, who granted the use of their materials.

SUBJECTS	SESSION 1	SESSION 2
I (n = 50)	Lecture A - Normal Followed by Test A	Lecture B - Time-Comp. Followed by Test B
II (n = 50)	Lecture B - Time-Comp. Followed by Test B	Lecture A - Normal Followed by Test A
III (n = 50)	Lecture B - Normal Followed by Test B	Lecture A - Time-Comp. Followed by Test A
IV (n = 50)	Lecture A - Time-Comp. Followed by Test A	Lecture B - Normal Followed by Test B

Fig. 1.--Experimental design used to control Lecture A and Lecture B difficulty levels.

had, in effect, 75 five-option multiple choice items. Scores were corrected for chance and given to the nearest whole number.

Administration of Tests Only

Comprehension tests were administered to 34 students without presentation of the lectures. The mean comprehension scores for Lectures A and B were 6.44 and 3.71 respectively. The average of these two mean scores is 5.08. Raw scores only were used in the study.

Questionnaire

The questionnaire given in Appendix A was devised to provide information concerning the students' degree of physical fatigue, tension and relaxation, anxiety and ease, self-assurance, interest and attention.[1]

Apparatus Used

Listening materials were recorded on magnetic tape supplied by the American Institutes for Research. They were presented free-field by the use of a Wollensak Model

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[1]Questions 3 through 9 were adapted from Donald B. Haines and W. J. McKeachie, "Cooperative versus Competitive Discussion Methods in Teaching Introductory Psychology," Journal of Educational Psychology, LVIII (December, 1967), 386-90.

1520 at 3 3/4 speed in a semi-soundproofed room.[1] Intelligibility of the lectures was considered to be good.

Design

This was a repeated measurement study in which subjects were compared with their own performances. The design used controlled for any differences in lecture A and Lecture B difficulty levels (Figure 1).

Procedure

After having performed a pilot study with 20 students, 200 students were assigned consecutively and at random to Groups I, II, III, and IV. To encourage a high level of performance, students were told that those who achieved a score in the upper 10% would receive a letter of commendation. The lecture was presented at 3 3/4 speed. Students answered the questionnaire and then proceeded to the comprehension test.

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[1]David B. Orr and Herbert L. Friedman, Research on Speeded Speech as an Educational Medium, Progress Report, Grant No. 7-48-7670-203 (Washington, D.C.: U.S. Department of Health, Education and Welfare, Office of Education, June, 1964); Thomas Sticht, "Some Relationships of Mental Aptitude Reading Ability, and Listening Ability Using Normal and Time-Compressed Speech," Journal of Communication, XVIII (September, 1968), 243-58.

Procedures Used to Analyze the Results

Raw scores were used for all computations. A comparison of comprehension was effected by (1) obtaining the mean scores and standard deviations under both conditions for the total sample and its four component groups. (2) t-tests were carried out in order to determine whether there were any significant effects between: the normal and time-compressed rate; the first and second order of presentation of the lectures; the form of Lecture A and the form of Lecture B. t-tests were also used to determine the significance of the differences between the normal rate and time-compressed rate mean comprehension scores, for the total sample and all subgroups. (3) Percentiles were computed manually for the normal rate scores. These were used as a reference normative base group for the time-compressed scores in order to observe the degree of separation between the two conditions.

Responses to the questionnaire were tabulated for each question and the percentages of responses were computed manually.

Presentation and Analysis of Data

Mean Comprehension Scores and Standard Deviations

The mean scores and standard deviations for the total sample and the four component groups are given by passage

and total lecture at both rates in Table 1. Of prime interest, the 200 subjects had a mean score of 24.89 at the normal rate, and a mean score of 16.66 at the time-compressed rate, showing a decrement of 8.23 points, or approximately one-third of the normal rate score.

The standard deviations may be considered to be uniform from passage to passage and from condition to condition. Differences of the standard deviations given for Groups I, II, III and IV are interpreted as reflecting the differences between the groups due to random sampling rather than having used matched groups. The larger differences between the standard deviations of the total scores and the passages reflects the increased length of the materials and the resulting wider range of scores.

t-tests

In order to determine if there were significant differences associated with the order of presentation (Session 1 versus Session 2), the form of the lecture (Lecture A versus Lecture B), and the rate (Normal versus Time-Compressed), t-tests were computed for the pairs of conditions. Tables 2 and 3 indicate that at the .05 level for a two-tail test, there was no significant effect of order or form on the mean comprehension scores for all four component groups.

TABLE 1

MEAN COMPREHENSION SCORES AND STANDARD DEVIATIONS FOR GROUPS I, II, III, IV, AND THE TOTAL SAMPLE

Group	Rate	Passage 1		Passage 2		Passage 3		Total Lecture	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
I	Normal	9.18	4.59	9.46	4.70	8.28	5.73	27.14	13.22
N = 50	Time-Comp.	5.04	4.51	4.88	3.53	7.18	4.02	17.10	10.30
II	Normal	9.50	5.59	8.90	5.16	7.06	6.14	25.46	15.30
N = 50	Time-Comp.	6.34	4.93	4.88	4.13	7.32	5.84	18.54	13.02
III	Normal	7.84	4.82	6.30	4.36	9.20	5.65	23.34	12.35
N = 50	Time-Comp.	6.64	3.83	5.18	3.24	5.14	4.35	16.82	8.82
IV	Normal	8.32	4.79	5.36	4.25	9.94	5.65	23.62	12.78
N = 50	Time-Comp.	6.32	4.24	4.48	4.00	3.38	3.44	14.18	9.72
Total	Normal	8.71	4.97	7.51	4.91	8.62	5.85	24.89	13.45
N = 200	Time-Comp.	6.09	4.41	4.86	3.72	5.76	4.75	16.66	10.62

TABLE 2

MEAN COMPREHENSION SCORES AND SIGNIFICANCE OF DIFFERENCES WHEN LECTURE IS PRESENTED FIRST VERSUS SECOND

Group	Variable	Mean	S. D.	t
I	A_{1N}	27.14	13.22	0.59 N.S.*
II	A_{2N}	25.46	15.30	
IV	A_{1C}	14.18	9.72	-1.42 N.S.*
III	A_{2C}	16.82	8.82	
III	B_{1N}	23.34	12.35	-0.11 N.S.*
IV	B_{2N}	23.62	12.78	
II	B_{1C}	18.54	13.02	-0.61 N.S.*
I	B_{2C}	17.10	10.30	

A = Lecture A

B = Lecture B

C = Time-Comp Rate

N = Normal Rate

1 = Presented First

2 = Presented Second

*Not significant at .05 level for two-tail test

TABLE 3

MEAN COMPREHENSION SCORES AND SIGNIFICANCE OF DIFFERENCES WHEN LECTURE A VERSUS LECTURE B IS PRESENTED

Group	Variable	Mean	S. D.	t
III	B_{1N}	23.34	12.35	1.48 N.S.*
I	A_{1N}	27.14	13.22	
IV	A_{1C}	14.18	9.72	-1.90 N.S.*
II	B_{1C}	18.54	13.02	
III	A_{2C}	16.82	8.82	-0.15 N.S.*
I	B_{2C}	17.10	10.30	
II	A_{2N}	25.46	15.30	0.65 N.S.*
IV	B_{2N}	23.62	12.78	

A = Lecture A

B = Lecture B

C = Time-Comp Rate

N = Normal Rate

1 = Presented First

2 = Presented Second

*Not significant at .05 level for two-tail test

However, the effect of rate was statistically significant at the .01 level for three of the four conditions shown in Table 4. All four differences were in the same positive direction. The differences in size of the t-values for Lecture A under both conditions, as compared with the t-values for Lecture B under both conditions, suggests that rate produced a stronger effect on Lecture A than it did on Lecture B. This possibility is supported by the fact that as originally devised by Friedman and Orr, Lecture A contained ten questions more than Lecture B. This was adjusted in scoring. However, it is plausible that the use of a larger number of questions was due to a larger number of ideas per listening time. It is well to note that greater density of ideas in Lecture A might have interfered with apprehension of the materials at the time-compressed rate, but had no effect at the normal rate when there was adequate time for the processing of the concepts presented.

t-tests also confirmed that the differences of the two comprehension scores were significant at the .01 level for the total sample and its four component groups (Table 5). Differences are large and in the same positive direction.

Percentiles

The use of percentiles afforded a clear view of the magnitude of the separation between the two mean scores.

TABLE 4

MEAN COMPREHENSION SCORES AND SIGNIFICANCE OF DIFFERENCES WHEN NORMAL RATE VERSUS TIME-COMPRESSED RATE IS PRESENTED

Group	Variable	Mean	S. D.	t
I	A_{1N}	27.14	13.22	5.58*
IV	A_{1C}	14.18	9.72	
II	A_{2N}	25.46	15.30	3.46*
III	A_{2C}	16.82	8.82	
III	B_{1N}	23.34	12.35	1.89
II	B_{1C}	18.54	13.02	
IV	B_{2N}	23.62	12.78	2.81*
I	B_{2C}	17.10	10.30	

A = Lecture A

B = Lecture B

C = Time-Comp Rate

N = Normal Rate

1 = Presented First

2 = Presented Second

*Significant at .01 level for two-tail test

TABLE 5

MEAN COMPREHENSION SCORES FOR NORMAL AND TIME-COMPRESSED RATES AND SIGNIFICANCE OF DIFFERENCES FOR ALL GROUPS

Group	Normal Rate Mean	Normal Rate S.D.	Time-Comp Rate Mean	Time-Comp Rate S.D.	t
All Subjects (N = 200)	24.89	13.45	16.66	10.62	6.80*
I (N = 50)	27.14	13.22	17.10	10.30	4.24*
II (N = 50)	25.46	15.30	18.54	13.02	2.45**
III (N = 50)	23.34	12.35	16.82	8.82	3.05*
IV (N = 50)	23.62	12.78	14.18	9.72	4.16*

*Significant at .01 level for a two-tail test

**Significant at .05 level for a two-tail test

Percentiles computed for the normal rate scores were used as the reference normative base group. Table 6 indicates that there was a difference between the two conditions that was almost equal to the semi-interquartile range. Thus, under time-compressed conditions, only about a quarter of the students did as well as the average student at the normal rate.

Table 7 indicates that the normal rate mean comprehension score for the total number of subjects was 24.89. Scores were positively skewed at the normal rate, so that this score was at the 55th percentile. The time-compressed mean comprehension score was 16.66. Scores were negatively skewed. This latter score fell at the 33rd percentile of the normal rate percentiles. Similar patterns were shown for all component groups.

TABLE 6

DEGREE OF SEPARATION BETWEEN NORMAL AND TIME-COMPRESSED QUARTILES

Rate	P_{25}	P_{50}	P_{75}
Normal	13.95	23.50	34.59
Time-Comp.	8.78	14.63	23.88

TABLE 7

PERCENTILES FOR THE MEAN COMPREHENSION SCORES OF ALL SUBJECTS AND THE FOUR COMPONENT GROUPS, SHOWING PERCENTILE DIFFERENCES BETWEEN THE NORMAL AND TIME-COMPRESSED CONDITIONS

Group	Normal Rate Mean	Percentile	Time-Comp Rate Mean	Percentile*	Percentile* Difference
All Subjects N = 200	24.89	55	16.66	33	22
I N = 50	27.14	58	17.10	33	25
II N = 50	25.46	56	18.54	37	19
III N = 50	23.34	53	16.82	33	20
IV N = 50	23.62	54	14.18	25	29

*Normal rate scores used as reference normative base group.

The foregoing divergent scores should be kept in mind when reviewing the degrees of comprehension established by previous studies. Fairbanks, Guttman and Miron recorded 90% as great comprehension for two passages that ran a little over five minutes each at a rate of 282 wpm.[1] Orr and Friedman reported, "The main result of the experiment indicated that naive (untrained) subjects suffer relatively little loss (0-20%) in listening comprehension at speeds up to twice normal speaking rates (up to 325 wpm)."[2] Foulke et al. reported no significant loss in comprehension of a scientific selection presented to 291 blind sixth, seventh and eighth grade pupils at 275 wpm.[3] The selection ran for seven and one-half minutes and was at the fifth to sixth grade level of readability. McCracken found no difference in comprehension when she presented four short selections at 160 wpm and

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[1]Grant Fairbanks, Newman Guttman, and Murray S. Miron, "Effects of Time Compression upon the Comprehension of Connected Speech," Journal of Speech and Hearing Disorders, XXII (March, 1957), 18.

[2]David B. Orr, and Herbert L. Friedman, Research on Speeded Speech as an Educational Medium, Progress Report, Grant No. 7-48-7670-203 (Washington, D.C.: U.S. Department of Health, Education and Welfare, Office of Education, June, 1964), p. ii.

[3]Emerson Foulke, Clarence H. Amster, Carson Y. Nolan, and Ray H. Bixler, "The Comprehension of Rapid Speech by the Blind," Exceptional Children, XXIX (November, 1962), 134-41.

another four short selections at 320 wpm from the Diagnostic Reading Tests, Section II.[1] The entire session, including testing, lasted approximately 30 minutes. It is apparent that when a realistic length of listening material was presented to sighted, college students, considerably less was comprehended at the time-compressed rate than was comprehended at the normal rate. The length of uninterrupted listening time appears to be a critical factor in its influence upon time-compressed listening comprehension.

In light of the data given in this study, it would appear necessary to examine the efficiency index presented by Fairbanks[2] and used by Foulke et al.,[3] Jester and

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[1] Sally McCracken, "Comprehension for Immediate Recall of Time Compressed Speech as a Function of Sex and Level of Activation," Proceedings of the Second Louisville Conference on Rate and/or Frequency-Controlled Speech (Louisville: University of Louisville, 1971), pp. 313-19.

[2] Grant Fairbanks, Newman Guttman, and Murray S. Miron, "Effects of Time Compression upon the Comprehension of Connected Speech," Journal of Speech and Hearing Disorders, XXII (March, 1957), 10-19.

[3] Emerson Foulke, Clarence H. Amster, Carson Y. Nolan, and Ray H. Bixler, "The Comprehension of Rapid Speech by the Blind," Exceptional Children, XXIX (November, 1962), 134-41.

Travers,[1] and Sticht.[2] Foulke and Sticht have expressed Fairbanks' efficiency index as a ratio between the comprehension score and the time used for presentation. They "found that learning efficiency increased as word rate was increased until a word rate of approximately 280 wpm was reached."[3] Foulke et al. concluded their study with the statement, "It was felt that those losses in comprehension that were statistically significant were not all educationally important, especially when the time saved in presenting the material was considered."[4] In view of the large loss in comprehension found in this study, it is important to point out that the efficiency index appears to rest on an underlying

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[1]Robert E. Jester and R. M. W. Travers, "Comprehension of Connected Meaningful Discourse as a Function of Rate and Mode of Presentation," Journal of Educational Research, LIX, No. 7 (1966), 297-302.

[2]Thomas Sticht, "Some Relationships of Mental Aptitude Reading Ability, and Listening Ability Using Normal and Time-Compressed Speech," Journal of Communication, XVIII (September, 1968), 243-58.

[3]Emerson Foulke and Thomas Sticht, "A Review of Research on the Intelligibility and Comprehension of Accelerated Speech," The Comprehension of Rapid Speech by the Blind: Part III, ed. by Emerson Foulke (Non-Visual Perceptual Systems Laboratory, Louisville: University of Louisville, 1969), p. 12.

[4]Emerson Foulke, Clarence H. Amster, Carson Y. Nolan, and Ray H. Bixler, "The Comprehension of Rapid Speech by the Blind," Exceptional Children, XXIX (November, 1962), 141.

assumption that all items are equally easy or difficult to learn, and that all items are equally important or unimportant to their educational objectives. Nor does it take into consideration the density of the ideas presented. In effect, as the efficiency index now operates, it tends to put a stamp of approval on those students who learned less, simply because they spent less time doing so.

The responses to the questionnaire (Appendix A) should be interpreted with caution since the wording gave subjects only two choices for most of the questions. Although it was necessary to limit the number of questions asked and the number of choices available, so as not to detract in time and effort from the subjects' performance on the comprehension tests, nevertheless the questionnaire did shed light on aspects of attitude and fatigue that proved of value in the interpretation of the results of the study.

Figures 2, 3, and 4 show that the responses to questions one and two indicate that listening to the time-compressed lecture for forty minutes was very tiring for more than twice as many subjects as found it very tiring to listen to the normal rate lecture for sixty minutes. The responses to questions three through six indicate that approximately four times as many of the subjects felt anxious and tense

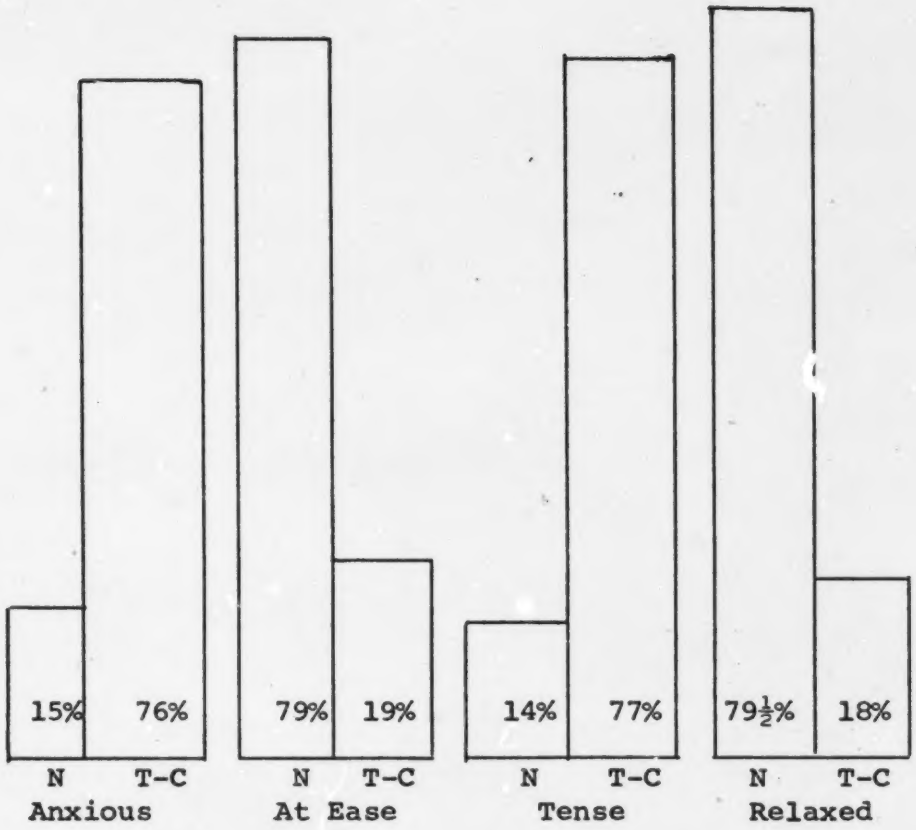

Fig. 2.--Percentages of the responses to questions 3-6 of the questionnaire shown in Appendix A. The balance of students gave no response.

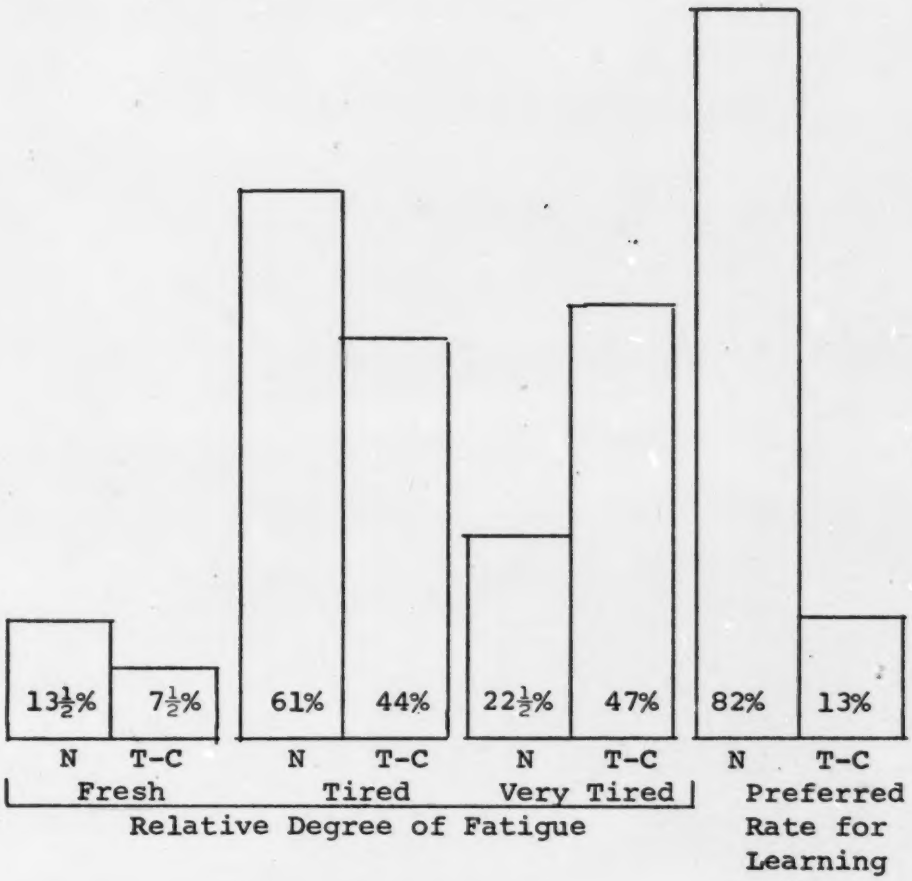

Fig. 3.--Percentages of the responses to questions 1, 2, and 9 of the questionnaire shown in Appendix A. The balance of students gave no response.

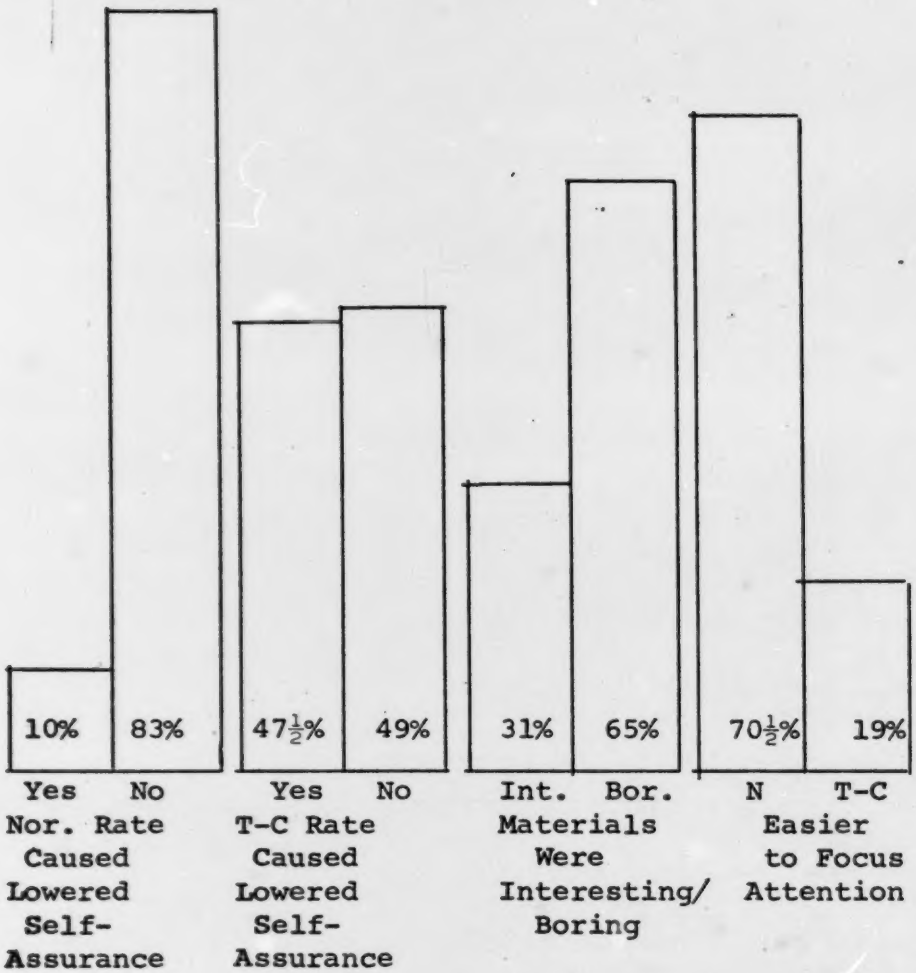

Fig. 4.--Percentages of the responses to questions 7, 8, 10, and 11 of the questionnaire shown in Appendix A. The balance of students gave no response.

while listening to the time-compressed rate as felt at ease and relaxed. At the normal rate, approximately five times as many subjects felt at ease and relaxed as felt anxious and tense. Questions seven through eight indicate that approximately as many felt the time-compressed rate lowered their self-assurance as felt it did not. Approximately eight times as many did not feel the normal rate lowered their self-assurance as felt the normal rate did so. The answers to question nine indicate that six times as many would prefer learning at the normal rate as would prefer learning at the time-compressed rate. Question eleven responses reported that approximately three and one-half times as many felt it easier to keep their attention focused on the materials at the normal rate.

Summary and Conclusions

This study has assessed the comprehension by 200 Brooklyn College students of a one-hour lecture at 175 wpm as compared with their comprehension of an equated time-compressed lecture at 275 wpm. A questionnaire assessed the physical and psychological reactions of the subjects. The one-hour lecture period was chosen because it was considered to be more realistically representative of the college students' listening experiences than the considerably shorter

periods that have been used by researchers to date. A t-test established that the difference between these two comprehension scores was statistically significant. Further t-tests for three criteria used, order of presentation, form of lecture used and rate used, proved rate alone to be statistically significant. Percentiles constructed using the normal rate comprehension scores as a reference normative base group, showed normal rate scores were positively skewed and that time-compressed rate scores were negatively skewed. This large drop in comprehension differs with findings reported by previous researchers.

The following conclusions are drawn:

1. The length of the stimulus materials used appears to be a critical factor. Time-compressed materials suffered a proportionately larger loss of comprehension when an educationally realistic length of materials was used.

2. The efficiency index suggested by Fairbanks and used by subsequent researchers has been questioned operationally because it fails to take the following factors into consideration: the density of the ideas present in the listening materials; the number of items not learned; the importance of the items learned and not learned; the relative difficulty of the items learned and not learned; a criterion

of acceptable comprehension stated in advance. It is suggested that an effective evaluation of an educational medium must take these factors into consideration.

3. The introduction of the efficiency index to justify the use of time-compressed speech as an educational medium has been further questioned because it puts a premium on learning less provided that less time has been spent doing so; it shifts the educational emphasis from how to educate more adequately to how to educate more groups; it encourages skimming rather than probing and analyzing.

4. It is suggested that time-compressed speech might be of educational value when used to develop controlled, graduated rates of spoken practice materials for developing speed in stenography and stenotyping.

5. Time-compressed speech may also serve a useful purpose in vigilance tasks which demand a choice among a limited number of alternatives, thus making the task one of discrimination or intelligibility rather than comprehension.

6. Further studies that would concentrate on the establishment of what might be considered to be an appropriate length of stimulus materials for a realistic testing situation at different educational levels would be valuable.

7. Further studies that would contribute toward the establishment of criteria for the measurement of idea

density within test materials would help to make the interpretation of comprehension scores more meaningful.

8. A larger number of students reported experiencing greater fatigue under the time-compressed condition than under the normal condition. This raises a question as to the efficiency of the use of time-compressed speech in education.

9. The very large number of subjects who reported feelings of tension, anxiety, and lowered self-assurance under the time-compressed condition would suggest that serious attention be given these aspects before considering the use of time-compressed speech as an educational medium.

APPENDIX A

QUESTIONNAIRE FORM

Name:_____ Male___ Female___
(last) (first)

Address:_____Cl. & Curr._____
(number) (street) (borough)

Is English your first language? Yes___ No___

YOUR OPINIONS ARE IMPORTANT TO US. IT WOULD BE HELPFUL IF YOU WOULD FILL IN THE FOLLOWING QUESTIONS.

		Please circle one.
1.	After the lecture with the normal rate, I felt	fresh, tired, very tired.
2.	After the lecture with the faster rate, I felt	fresh, tired, very tired.
3.	The faster rate made me feel	anxious, at ease.
4.	The normal rate made me feel	anxious, at ease.
5.	The faster rate made me feel	tense, relaxed.
6.	The normal rate made me feel	tense, relaxed.
7.	The faster rate made me doubt my own abilities and lowered my self-assurance.	yes no
8.	The slower rate made me doubt my own abilities and lowered my self-assurance	yes no
9.	I would prefer learning by the	faster, slower, rate.
10.	The subject matter was	interesting, boring.
11.	I found it easier to keep my attention focused on the subject matter during the	faster, slower, rate.

Further comments:

Bibliography

Carroll, John B. Language and Thought. Englewood Cliffs, N.J.: Prentice-Hall, 1964.

Cramer, H. Leslie. "An Introduction to Speech Compression Techniques: The Early Development of Speech Time Compression Concept and Technology." Proceedings of the Second Louisville Conference on Rate and/or Frequency-Controlled Speech. Louisville: University of Louisville, 1971, pp. 6-20.

Davis, Hallowell and Silverman, S. Richard. Hearing and Deafness. 3rd ed., New York: Holt, Rinehart and Winston, 1970.

Duker, Sam. Time-Compressed Anthology and Annotated Bibliography. 3 vols. Metuchen, N.J.: Scarecrow Press, 1974.

Fairbanks, Grant; Guttman, Newman; and Miron, Murray S. "Effects of Time Compression upon the Comprehension of Connected Speech." Journal of Speech and Hearing Disorders, XXII (March, 1957), 10-19.

Foulke, Emerson. "Comparison of Comprehension of Two Forms of Compressed Speech." Exceptional Children, XXXIII (November, 1966), 169-73.

Foulke, Emerson; Amster, Clarence H.; Nolan, Carson Y.; and Bixler, Ray H. "The Comprehension of Rapid Speech by the Blind." Exceptional Children, XXIX (November, 1962), 134-41.

Foulke, Emerson and Sticht, Thomas. "A Review of Research on Time-Compressed Speech." Proceedings of the Louisville Conference on Time-Compressed Speech. Louisville: University of Louisville, 1967, pp. 69-76.

Foulke, Emerson and Sticht, Thomas. "A Review of Research on the Intelligibility and Comprehension of Accelerated Speech." The Comprehension of Rapid Speech by the Blind: Part III. Emerson Foulke, editor. Non-Visual Perceptual Systems Laboratory, Louisville: University of Louisville, 1969.

Friedman, Herbert L.; Orr, David B.; and Graae, Cynthia N. Further Research on Speedes Speech as an Educational Medium. Final report, Parts 1-5, July 1965-September 1967. Silver Spring, Md.: American Institutes for Research in Behavioral Sciences. Project No. 5-0801, Grant No. OE 7-48-7670-267. U.S. Department of Health, Education and Welfare, Office of Education.

Gore, George V. "A Comparison of Two Methods of Speeded Speech Presented to Blind Senior High School Students." Unpublished Ed.D. dissertation, Teachers College, Columbia University, 1968.

Haines, Donald B. and McKeachie, W. J. "Cooperative versus Competitive Discussion Methods in Teaching Introductory Psychology." Journal of Educational Psychology, LVIII (December, 1967), 386-90.

Jester, Robert E., and Travers, R. M. W. "Comprehension of Connected Meaningful Discourse as a Function of Rate and Mode of Presentation." Journal of Educational Research, LIX, No. 7 (1966), 297-302.

Lorge, Irving. Article evaluating the Sequential Tests of Educational Progress. The Fifth Mental Measurements Yearbook. Edited by Oscar K. Buros. Highland Park, N.J.: The Gryphon Press, 1959, pp. 579-82.

McCracken, Sally. "Comprehension for Immediate Recall of Time Compressed Speech as a Function of Sex and Level of Activation." Proceedings of the Second Louisville Conference on Rate and/or Frequency-Controlled Speech. Louisville: University of Louisville, 1971, pp. 313-19.

Michel, Leslie A. "Levels of Comprehension and Activation Under Conditions of Time-Compressed Speech." Unpublished Master's thesis, Florida State University, June, 1970.

Orr, David B., and Friedman, Herbert L. Research on Speeded Speech as an Educational Medium. Progress Report, Grant No. 7-48-7670-203. Washington, D.C.: U.S. Department of Health, Education and Welfare, Office of Education, June, 1964.

Sticht, Thomas. "Failure to Increase Learning Using the Time Saved by the Time Compression of Speech." Journal of Educational Psychology, LXII, No. 1 (1971), 55-59.

_____. "Some Relationships of Mental Aptitude Reading Ability, and Listening Ability Using Normal and Time-Compressed Speech." Journal of Communication, XVIII (September, 1968), 243-58.